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ABSTRACT

This paper identifies the major modes of thought that have characterized the conduct of teaching, research, and supervision at institutions of higher education, focusing specifically on the fields of psychology and education. These frameworks for thinking (paradigms) in both the social and "hard" sciences have progressed through three major shifts: (1) Aristotelian, which focuses on the dichotomy of objects and phenomena; (2) Galileian or Newtonian, which emphasizes empirical knowledge; and (3) Einsteinian, which emphasizes the importance of the frame of reference (i.e. relativity). It is argued that researchers in the social sciences have attempted to emulate the hard sciences, and have adopted a Newtonian outlook, emphasizing simplicity, uniformity, predictability, and control. Specific issues related to curriculum development, learning disabilities, and reading instruction are discussed. It is maintained that, although this perspective is not wrong in any absolute sense, it tends to cause an excessive simplification of the conditions and transactions present in teaching, learning, and research. (MDM)

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PERVASIVE MODES OF THINKING THAT AFFECT OUR CONDUCT OF TEACHING, SUPERVISION AND RESEARCH: ARE WE STUCK IN AN OLD PARADIGM?

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Abstract

The underlying concepts we employ about our research, teaching, and supervision function as instruments for understanding the world. These frameworks for thinking--paradigms--in both the social and "hard" sciences have progressed through three major shifts that can be labeled Aristotelian, Galileian (Newtonian), and Einsteinian. In the social sciences such as psychology and education, researchers have attempted to emulate the hard sciences and have adopted Newtonian science: simplicity, uniformity, predictability and control. This perspective is not wrong in any absolute sense, but rather is an excessive simplification of the conditions and transactions present in teaching, learning, and research endeavors. This paper identifies major modes of thought that have characterized the conduct of teaching, resarch, and supervision in all fields, focusing specficially on psychology ad education. Examples from these fields illustrate these modes of thinking.

Descriptors: paradigm shifts, history of science, reading education

In a paper published 50 years ago, Kurt Lewin (1931) described a conflict between Aristotelian and Galileian modes of thought in contemporary psychology. Lewin contrasted how Aristotelian concept formation in physics, which was anthromorphic, valuative, categorical and inexact, determined the actual research of the medieval Aristotelian scholastics, just as Galileian concept formation, which was continuous, functional, empirically-derived, lawful and exact, affected the research of post-Galileian physicists.

In the Aristotelian view, reality was dichotomously classified in accordance with the essential nature of objects: such as warm and cold, hard and soft, wet and dry. Thus, naturally occurring phenomena such as the planets of the solar system were categorized according to the values of their qualities such as "heavenly" or "earthly," rather than according to lawful processes such as gravitation acting universally on all planets.

The transformation from the Aristotelian mode of thought to modern science was accomplished in the sixteenth century by the heretic Galileo, who challenged Aristotle's prescientific beliefs about the static nature of the universe. Galileo put Aristotle's assertions about the motion of falling bodies to an empirical test by dropping cannon balls from the learning Tower of Pisa and observing that heavy ones did not fall faster than light ones.

In the words of Wendell Johnson (1945), "What he demonstrated was not so much a fact about falling weights, a fact against which Aristotle had contended, as a new problem-solving method based not on the authority of age and prestige, but rather on the authority of observation

and experiment" (p. 31). In sum, the difference between the two modes of thought is that Aristotle's is a fixed, static, rigid, authoritarian, dichotomous conception of reality while Galileo's is a dynamic, process, adaptable, scientific, conception of reality.

A third mode of scientific thought we attribute to Einstein and refer to as the Einsteinian contextual/relativistic mode. Prior to Einstein, the post-Galileian/Newtonian universe was seen as absolute with a fixed Euclidean geometry. Einstein recognized the importance of the frame of reference, or the relative context in which one makes an observation. To illustrate the concept of relativity, Einstein (1961) performed the following Gedenken experiment or thought experiment.

> I stand at the window of a railway carriage which is traveling uniformly, and drop a stone on the embankment, without throwing it. Then, disregarding the influence of the air resistance, I see the stone descend in a straight line. A pedestrian who observes the misdeed from the footpath notices that the stone falls to earth in a parabolic curve. I now ask: Do the "positions" traversed by the stone lie "in reality" on a straight line or on a parabola? (p. 9)

Einstein's answer was that the stone travels in a straight line relative (to a system of co-ordinates rigidly attached) to the train, but in a parabola curve relative (to a system of coordinates rigidly attached) to the embankment. In other words, the path of the stone is not "an independently existing trajectory. . .but only a trajectory relative to a particular body of reference (p. 10)." Einstein's insight was that there is no "preferred" or absolute frame of reference.

In the post-Einsteinian, contemporary view of science, "perception is not a reflection of 'real things' (whatever their metaphysical status), and knowledge not a simple approximation to 'truth' or 'reality.' It is an

interaction between knower and known, this dependent on a multiplicity of factors of a biological, psychological, cultural, linguistic, etc., nature (von Bertalanffy, 1968. p. xxii)."

In the hard sciences, the post-Galileian, classical view which had conceived of the world in single cause, single effect, single level of analysis terms has given way to general systems approaches. In the past, each scientific discipline had attempted to discover the lawful basis of its science, along with its reductionistic, elementary particles, in isolation from other disciplines. In recent decades, however, new, interdisciplinary sciences have emerged and the boundaries between traditional disciplines have become permeable. New multilevel, multicause, multieffect interactive models are now understood to be required to explain observed behavior.

To return to Lewin (1931), the thrust of his argument was that psychology of the 1930s was, for the most part, stuck in the Aristotelian mode of thought. In the 50 years since Lewis wrote his paper, however, not enough progress has been made. While the leading edge of psychological and educational research has ventured into the domain of contextual/relational investigation, as evidenced by the development of interdisciplinary sciences such as biopsychosocial psychology (Schwartz, 1982) and general systems research in psychology (von Bertalanffy, 1968), most research is still conducted in the classical, Galileian mode, viewing human behavior in stimulus-response terms, or seeking to isolate the effects of single causal variables such as self-efficacy. Furthermore, some clinical practice is still imbedded in the Aristotelian mode where clients are diagnosed and fitted into categories and are then assumed to have the general properties of that category. Psychological

events continue to be classified as "normal" versus "pathological" and children are routinely classified as good versus poor readers. In Lewin's time, as in our own, "psychology speaks of the 'errors' of children, of 'practice', of 'forgetting', thus classifying whole groups of processes according to the value of their products, instead of according to the nature of the psychological processes involved (p. 3)."

It is our contention that psychologists and educators would benefit from becoming more aware of the modes of thought in which we operate, as researchers, clinicians, and as teachers. Furthermore, we suspect that most of our students come to us as naive Aristotelians seeking to know into what category each fact should be properly placed, and parenthetically, whether or not it will be on the exam. Leading our students into a synamic understanding of lawful relationships between events is often a difficult task. An even more difficult task is teaching our students (and ourselves) to think about events as multilevel, multicasual, and multieffect systems, and to consider the contexts in which those learning events occur.

Thought Modes in Education

Doll (1986) also groups the history of Western thought into three broad paradigms: the classical/Christian developed by Aristotle, Ptolemy, and Thomas Aquinas; the "classical/Scientific" based on Galileo and summarized by Newton, and the still unfolding "post positivist" paradigm emerging from the work of Albert Einstein, Neils Bohr, and Werner Heisenberg. We rarely base our research on the Aristotelian paradigm today, but in a sense, the binary nature of that paradigm is subsumed in the more sophisticated Newtonian paradigm which is still pervasive. It is

useful to look at some particular examples of these thought modes in several fields of education.

Research

In educational research, Lincoln and Guba (1985), Lather (1986), Doll (1986) and others have made a strong case that in the attempt to emulate the scientific method of the hard sciences, educational researchers, learning theorists, and curriculum designers have adopted the tenets of Newtonian science: simplicity, uniformity, predictability and control rather than to develop a more relativistic or organistic modes of thinking. The Newtonian thinker believes that all actions can be determined by a cause and measured in quantifiable terms. Factor analysis and the notion of a single IQ number are based on this notion of simple reductionism.

This perspective is not wrong in any absolute sense but rather is an excessive simplification of the conditions and transactions present in teaching, learning and research contexts. An example of the extreme nature of this decontextualized research in teacher education, we site two well-known researchers, Coladarci and Gage (1984). They mailed a series of training packets to teachers and then observed to see if teachers implemented any of the packet materials. Having measured a number of variables and finding no significant difference in teaching or learning in the classroom, the researchers made this incredible statement:

> It appears that for an intervention to be successful, the project staff just be engaged with participant teachers in some fashion (cited in Lanier and Little, 1986, p. 528).

Just bad research? Perhaps, but it points to the intoxicating belief that any crunchable numbers may afford valuable information, despite the

lack of engagement of the participants and an acknowledgement of the context. That the "researched" need to be engaged in the focus of the research is not news to vanguard thinkers in any field. Indictments of the current state of education and of the research efforts which have characterized the field for 100 years have left the field groping for a new vision of the basic axioms of research: the role of the researcher, the nature of reality, the relationship of the knower to the known, and even the possibilities of generalization. Typical of the indictments is a statement by Lanier and Little (1986), in their review of research in teacher education:

> . . . the study of social entities such as teacher education is apt to be advanced least by adherence to the classic natural science modes of inquiry. (Meaningful isolation and control of variables in complex social affairs in rarely, if every, possible and is not recognized, therefore, as a particularly fruitful line of contemporary inquiry in teacher education (p. 528), our emphasis).

We believe that new paradigm thinking (changes in teaching research practice?) and reform in teacher education will go hand-in-hand as actual classroom teaching becomes the focus of research. This new thinking which values development of relationships within the research context and joint development of problems to be researched will result in a contextualized mode of research and in the development of knowledge about teaching and learning which cannot be gained through old paradigm thinking. Researchers will no longer stand objectively outside the research context looking for quantifiable information.

Curriculum

The development of curriculum for the past hundred years has evolved in terms of task analysis and hierarchial views of knowledge. Almost any state, local, or school curriculum guide spells out the learner objectives to be mastered in a hierarchical fashion. However, we are seeing some movement in the Indiana State Curriculum Guide in terms of the writing objectives. We are beginning to see curriculum frameworks emerge in place of or in addition to specific objectives. (See Indiana State Curriculum Guide: Writing, 1988).

Teaching: Language Education

In education we have begun to view teaching, learning and research as a process rather than a product. In the field of reading education specifically, Harste (1986), in a state-of-knowledge, state-of-the art assessment project in reading comprehension and instruction found three distinct paradigms in thinking. He and other researchers (Britton, Bridge) feel that this change amounts to no less than a paradigm shift. He sites some major shifts in assumptions which undergird the hypotheses being tested by reading researchers in the past ten years:

- The relationship between text and the reader. The old paradigm (Aristoletian) thought in terms of information transfer (See Figure 1). Language instruction was in terms of helping children to "get the meaning from the text." The key variables are the reading skills the learner has acquired. Instruction is in terms of teaching isolated skills in the belief that those skills would somehow add up to reading proficiency.

The interim paradigm (Newtonian) thought in terms of interaction (See Figure 2). In this model the meaning resides in the text and in the head of the reader. Reading then becomes of process of these two meaning systems interacting. Key variables are reading skills and text organization. Good readers interact with text differently than do poor readers. Instruction is in terms of reading skills and metacognitive strategies related to text analysis.

The current emerging paradigm (Einsteinian) thinks in terms of transaction (See Figure 3). Meaning is relative because it is the result of the readier in a particular context in contact with a particular text. Therefore, it is assumed that readers will have varying interpretations of text. Key variables in the process are contextual: culture, socio-historical context, experience, literacy histories of the individual readers.

- **Models of reading instruction**.

Related to the shift in thinking described above is the area of reading instruction. The following figures represent the modes of thinking about how reading should be taught--phonics (Aristotelian), skills (also Aristotelian) and whole language models (post Einsteinian).

Given the shifts described above, it seems that we are going from outsider to insider views of language learning, from categorical to contextual thinking. Harste (1988), in the National Yearbook of the National Reading Conference writes,

> Rather than to ask which behaviors by teacher are positively correlated with student gains on test of achievement, the new comprehension researcher is asking questions of collaboration, "How is it that it can make sense to students to learn in one situation and not in another? What are the teacher and students doing differently? How are these meaning systems created and sustained in daily interaction? What does reading comprehension

mean in this classroom as opposed to other classrooms and how do these definitions-in-use relate to morale and what we see as the goals of reading and reading instruction?

Harste is asking contextual questions. Like many vanguard researchers in the field, he is not interested in pursuing dichotomous variables for the purposes of labeling either children or teachers. He is discovering from his research work within actual teaching/learning contexts, that label do not serve us in our goals to get on with the process of educating children. The label of "learning disabled" is a case in point.

Learning Disabilities

Aristotletian: dyslexic/non-dyslexic. The disability is a property of the child.

Galileian: Many processes underlying dyslexia. May have cut-off point in terms of funding and programs, but is a continuum. The learning disability is not a property of the child, but a combination of interacting variables.

Einsteinian: Child is dyslexic depending on the context. (DePaul school criteria for dyslexia). Many children exhibit these characteristics to some extent. The willingness of teachers to interpret the child's behavior in terms of 1) the label, 2) the underlying processes or 3) the context determines how that child is treated within the educational system. There is currently a movement toward mainstreaming children with learning disabilities. The contexts in which those children learn will change dramatically in some cases. If teachers can change their ways of thinking about labeled children, they can begin to examine the contexts in which they see those children. They may indeed find that the

environments which they create can serve to change labels dramatically, and the children, in many cases. The two examples below show the possibilities of teacher's perspective as a catalyst for change.

Jane. Children are experimenters with the language. They try out letter formations, spacing, punctuation in ways that often confuse the adult reader. In Newman's (1984) book, The Craft of Children's Writing, we see an example of mirror writing, often associated with a group of behaviors defined as dyslexia. The child wrote everything backwards because, as the researcher later found out, the child had drawn the figure of a girl on the far right of the page, and the "balloon" for her speech was drawn to the left. As the child explained, in order for the words to come out of the figure's mouth, they had to start out the right and be written with the first letter next to the figure's mouth. When we understand the child's perspective and become researcher within the setting we can no longer view the writing sample as a piece of data to be analyzed, but rather as problem-solving situation for the child. Newman writes of this language sample:

> The organizational decisions Jane (age five) makes on this fifth page of a book she wrote are interesting. Having placed her drawing in the lower right corner, she has to figure out some way to represent the fact that the text consists of the words being spoken by the figure. She does that by electing to have it "emerge" from the figure--which means that the writing has to be both backwards and from bottom to top, a convention we might have adopted in cartoons and one with which children frequently experiment. Jane creates another organizing device as well. She uses hyphens between words to show that connected nature of the speech (p. 19).

In fact, instead of Jane's demonstrating a skill deficit, she is actually displaying a very complex array of rather advanced skills.

Angela. An example of contrasting old paradigm and new paradigm thinking is even more dramatic in its reinforcement of context as a necessary component of research and thinking about language education and the teacher's role as inside researcher. A child named Angela was eleven when she entered Cora Five's fifth grade classroom. She and her two older brothers had been declared learning disabled by the appropriate committee in the school district. The school had attempted to place all three children in a special school for students with disabilities. When parents refused, the children were given instructional assistants who worked with them on an individual basis for fifteen hours a week. In first grade she had been given the Peabody Picture Vocabulary test which placed her with an IQ of 73. By the end of first grade she was labeled learning disabled. Because of her seeming disabilities, she either dictated her assignments to the instructional assistant or had her spelling and mechanical errors immediately corrected. The teacher, Cora Five, has written a moving account of this child's blossoming into an active reader and writer who was willing to make choice and take responsibilities for her learning. Five (1988) writes:

> Was it the environment that enabled Angela to grow and change over time as a writer, a learner, a person? What part did I play in helping these changes to occur? Seemingly, my instructional approach enabled Angela to develop self-confidence and independence. It also provided her many opportunities to read and write and to see demonstrated a variety of strategies for effective communication. This environment gave her options and allowed her to take risks. There were expectations set for her and she developed some for herself. She was part of community of learners and experienced the flow of ideas through reading, writing, listening, and talking.
>
> For years, Angela has been isolated with an aide attempted to learn by herself, practicing number facts and working in

> handwriting, spelling, and phonics books. . . . The curriculum for the learning disabled has very specific skill-oriented goals for students like Angela.
>
> A comprehension-centered, supportive environment seemed to let Angela be a successful learner--severely labeled, perhaps, but not severely disabled (p.20).

It takes a great deal of effort to learn about contexts. For a classroom teacher it means taking responsibility for being the creator of contexts in which children appear either successful or unsuccessful, abled or disabled. Labels become catch phrases to which we can attach simplistic definitions. We gravitate naturally toward labels of every kind--Hispanic, female, dyslexic, etc., expecting those labels to give or send valuable information in a shorthand way. However, labels cause us to quickly lose sight of the underlying dimensions of the label itself (not to mention the individual) and scarcely ever bring us into contact with the specific contexts in which people act out their supposed labels.

Unfortunately, the children to whom labels are attached are taught in terms of their label and not terms of their actions in a particular context. (Danger of equating the part with whole.) Instead of being a human being with dyslexia, they become a dyslexic. Both stigmatizing for the individual and creates expectations for the teacher and does not further advance the understanding of the problem or of the context in which the problem is enacted. Too often the context itself is the cause of the disability, but the teacher/researcher cannot discover that unless the context itself becomes the unit of analysis rather than the child or the disabling behaviors.

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Application

We invite the reader to apply these ideas of paradigm shift and perspective to his or her own field. Consider again the three major paradigms of scientific thinking: Artistotelian, Galileian and Einsteinian. Then look at the comparative features of these paradigms, their goals, and think of some examples in the sciences of fields that seem to gravitate toward a particular paradigm. Fig. 4 will help you focus your thinking.

Now think of a major problem or concern in your field. First conceptualize the problem as a two-valued dichotomous or categorical variable. For example, in the field of education, we could view learning to read as a major problem or concern. A two-valued variable might be " dyslexic/non-dislexic." Now conceptualize a cause or lawful dimension that underlies the variable. The cause for dylexia could be minimal brain-damage. Finally, conceptualize a natural context within which the problem occurs, within which it may be researched and may be understood. Fig. 5 will help you to see the framework for such an exercise--the persvasive modes of thinking--Artistotelian, Galileian, Einsteinian--that cause us to frame our fields, their problems, and our modes of investigation.

Conclusions

Lewin, Doll, and others have given us metacognitive tools and frameworks for thinking about our thinking. The application of their ideas

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can challenge the way we think about our conduct of teaching, supervision, and research. What might the classroom look like for a contextual thinker? • Learning teams, group generation of knowledge, time for reflection and analysis, debate, development of student's own questions and research issues. What might teaching look like for a contextual thinker? • Teaching would in terms of the joint curriculum development with students and other teachers, "transactional replay journals" in which group processes and learning events are "played back" by the instructor for metacognitive analysis. What might research in education look like for the contextual thinker? • Joint development of a research problem between students, university faculty and professionals in the discipline, joint data analysis, the classroom or the family as the context for research. New paradigms of thinking and action in all fields provide not only new answers, but new questions. Researchers in all fields have witnessed the movement toward more expansive paradigms of thought. As was said of Newton at the beginning of this paper, "What he demonstrated was not so much a fact about falling weights, a fact against which Aristotle had contended, as a new problem-solving method based not on the authority of age and prestige, but rather on the authority of observation and experiment." Then next major shift opccurred when Einstein recognized the importance of the frame of reference, or the relative context in which one makes an observation. It should also be said of modern thinkers that we are not stuck in an old paradigm based either on the authority of age and prestige, nor on the authority of observation and experiment, but rather that we are devising new problem-solving methods based on the interaction of participants within a specific context.

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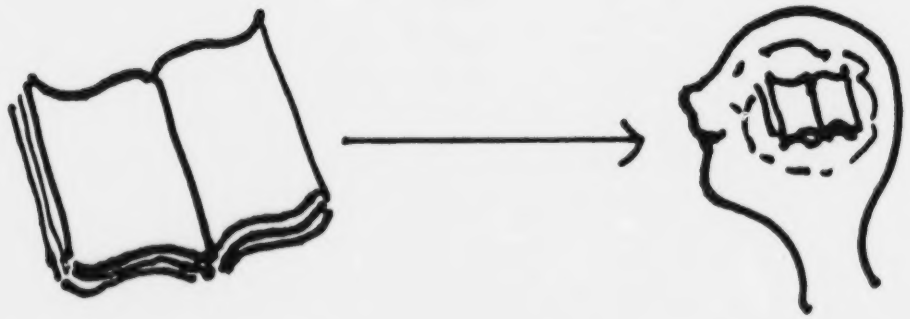
Fig. 1 **Paradigms of Reading Comprehension**

One: Information Transfer

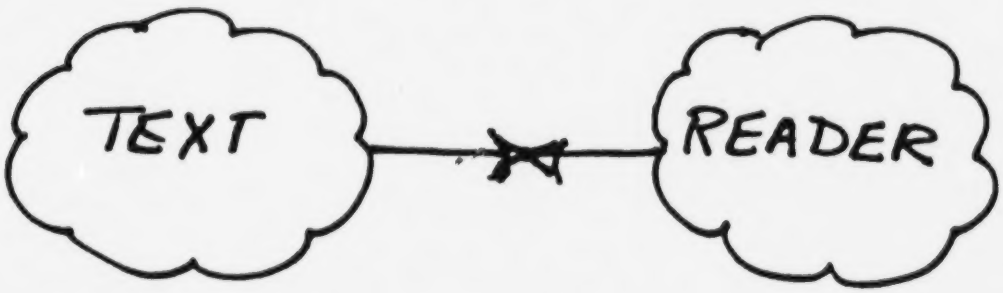


- Meaning is in the text
- Reading is a precise process of transferring meaning from text to reader
- Key variables in this process are reading skills
- Good readers transfer more information than poor readers
- The criterion for judging reading success is how much information was transferred

Sharon V. Andrews,1991
adapted from Harste,1988

Fig. 2 **Paradigms of Reading Comprehension**

Two: Interaction

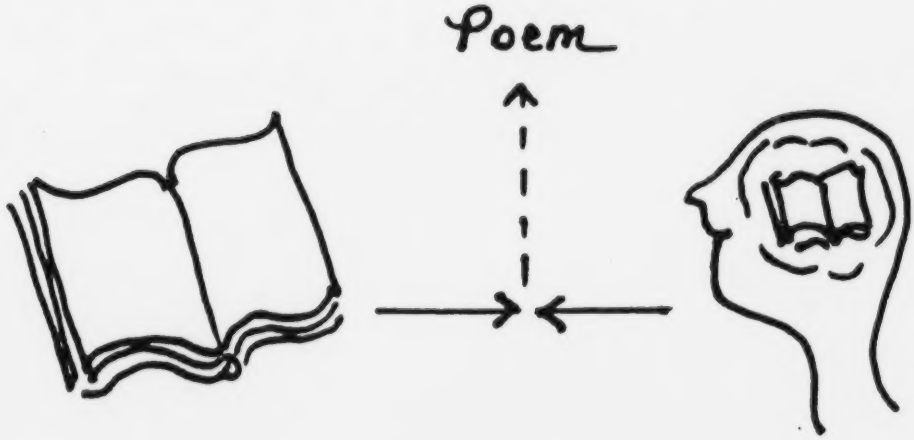


- Meaning is in the text
- Reading is a process of transferring meaning from text to reader
- Key variables in this process are reading skills
- Good readers transfer more information than poor readers
- The criterion for judging reading success rests upon our knowledge of what strategies an ideal reader would have used given these text features and/or reading conditions

Sharon V. Andrews, 1991
adapted from Harste, 1988

Fig. 3 **Paradigms of Reading Comprehension**

Three: Transaction



- **Meaning is relative**
- **Reading is a process of interpretation**
- **Key variables in this process are culture, socio-historical context, experience and individual's literacy history**
- **Good readers use print to successfully explore and expand their world**
- **The criterion for judging reading success rests upon learning evidenced**

Sharon V. Andrews, 1991
adapted from Harste, 1988

Fig. 4

Pervasive Modes of Thought

Aristotelian	*Galileian*	*Einsteinian*
Comparative Features		
categorical	*continuous*	*contextual*
single level	*single level*	*nested levels*
single cause	*chain of causes*	*multiple causes*
single effect	*chain of effects*	*multiple effects*
anthropormorphic	*lawful*	*lawful*
valuative	*objective*	*relative*
Goal of Science		
classification	*isolation of cause*	*description of context*
Examples in Science		
Botany	*Classical mechanics*	*Relativity Theory*
Zoology	*Darwinism*	*Ecological Systems*
Personality Types	*Behaviorism*	*Ecological Psychology*

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Fig. 5

Pervasive Modes of Thinking

Think of a major problem or concern in your field.

Psychology	Education	Medicine
psychopathology	*reading*	*AIDS epidemic*

1. **Conceptualize the problem as a two-valued dichotomous or categorical variable.**

Psychology	Education	Medicine
normal/abnormal	*Dyslexic/non-dyslexic*	*AIDS/not AIDS*

2. **Conceptualize a cause or lawful dimension that underlies the dichotomous variable.**

Psychology	Education	Medicine
Reinforcement history	*Minimal brain damage*	*HIV Infection*

3. **Conceptualize a natural context within which the problem occurs, may be researched, and may be understood.**

Psychology	Education	Medicine
family	*classroom*	*social behaviors*

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